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ACTIVITIES OF FEDERAL AGENCIES CONCERNING SELECTED HIGH VOLUME CHEMICALS

Environmental Protection Agency
Washington, D. C.

February 1975

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The report summarizes the nature and extent of many of the research and regulatory activities of the Environmental Protection Agency and other Federal Agencies directed towards fifty high volume chemicals. The text surveys past and on-going research supported by EPA and these other agencies which concerns any of the fifty high volume chemicals. It also discusses the regulatory authorities which are being or could be used to control these chemicals. The appendix includes twenty-three charts indicating the various activities directed toward these chemicals.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
High Volume Chemicals Federal Research and Regulatory Activities		

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Office of Toxic Substances
U.S. Environmental Protection Agency
Washington, DC 20460

February 1975

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PREFACE

This Report summarizes the nature and extent of many of the research and regulatory activities of the Environmental Protection Agency and other Federal Agencies directed towards fifty high volume chemicals. The Report is intended to assist those persons and organizations interested in anticipating and avoiding future incidents involving major chemicals.

This Report was stimulated, in part, by the recent activities concerning vinyl chloride and polyvinyl chloride, which are among the leading products of the chemical and plastics industries. The incidence of a rare cancer, angiosarcoma of the liver, in polyvinyl chloride polymerization workers led to an intensive investigation of the effects of exposure to vinyl chloride. Specifically, in February 1974, the Administrator established the Vinyl Chloride Task Force to examine all aspects of vinyl chloride released to the environment. The Task Force Report, Preliminary Assessment of the Environmental Problems Associated with Vinyl Chloride and Polyvinyl Chloride, outlines the extent of the problem and recommends a series of research and regulatory actions. This experience has underscored the need for greater attention to the high volume chemicals -- to assess more fully potential hazards and to take appropriate preventive measures at the earliest possible time.

The chemicals considered in this Report were identified in the May 1974, issue of Chemical and Engineering News, with an indication of 1973 production levels, and are presented on page ii of this Report. Production level is only one of several factors which must be considered in determining the environmental significance of a chemical, and there is no intention to imply that the chemicals considered in this Report represent the highest priority chemicals from the environmental point of view.

The Report is divided into summaries of the activities of the Environmental Protection Agency and those of other Federal Agencies. Subsequent charts and Appendices present in more detail the various research and regulatory activities directed to the fifty high volume chemcals. This description of Federal activities is undoubtedly not complete, although most important activities are believed to be included. Finally, the Appendices include a brief section on selected high volume plastics and additional tables.

The Office of Toxic Substances prepared the Report, using contributions from many specialists within the Environmental Protection Agency and other Federal Agencies.

SELECTED HIGH VOLUME CHEMICALS
(1973 Production in Billions of Pounds)

1	Sulfuric acid	63.18
2	Oxygen, high and low purity	31.87
3	Ammonia, synthetic anhydrous	30.94
4	Ethylene	22.41
5	Sodium hydroxide, 100% liquid	21.36
6	Chlorine, gas	20.60
7	Nitrogen, high and low purity	16.38
8	Sodium carbonate, synthetic and natural	14.99
9	Nitric acid	14.86
10	Ammonium nitrate, original solution	13.89
11	Phosphoric acid, total	13.00
12	Benzene, all grades	10.65
13	Propylene	8.76
14	Ethylene dichloride	7.90
15	Urea, primary solution	7.12
16	Methanol, synthetic	7.12
17	Toluene, all grades	6.78
18	Ethylbenzene	6.50*
19	Formaldehyde, 37%	6.17
20	Styrene	6.01
21	Xylene, all grades	5.90
22	Vinyl chloride	5.35
23	Hydrochloric acid, total	4.78
24	Ammonium sulfate	3.97
25	Ethylene oxide	3.88
26	Butadiene (1,3-), rubber grade	3.66
27	Carbon black	3.50
28	Ethylene glycol	3.29
29	Sodium sulfate, high and low purity	2.85
30	Carbon dioxide, all forms	2.77
31	Dimethyl terephthalate	2.69*
32	Cumene	2.67
33	Terephthalic acid	2.49*
34	Acetic acid	2.42
35	Calcium chloride, solid and liquid	2.40*
36	Cyclohexane	2.35
37	p-Xylene	2.32
38	Aluminum sulfate, commercial	2.27
39	Phenol, total	2.25
40	Acetone	1.99
41	Ethanol, synthetic	1.97*
42	Sodium tripolyphosphate	1.83
43	Isopropanol	1.76
44	Propylene oxide	1.75
45	Acetic anhydride	1.55
46	Titanium dioxide	1.54
47	Vinyl acetate	1.48
48	Sodium silicate (water glass)	1.46
49	Acetaldehyde	1.40*
50	Acrylonitrile	1.35

*Estimate. Reprinted with permission from Chemical and Engineering News (Vol. 52, No. 18, p. 11, 5/6/74). Copyright by the American Chemical Society.

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ACTIVITIES OF THE ENVIRONMENTAL PROTECTION AGENCY

Office of Water and Hazardous Materials

Water Pollution

Effluent Limitations

The Federal Water Pollution Control Act requires EPA to set limits on the amount of discharge permitted into navigable waters. Effluent Limitations Guidelines have been promulgated for thirty industries which produce or use as a main ingredient one or more of the high volume chemicals considered in this Report. The industries involving several of these chemicals are the organic chemical, inorganic chemical, plastics, fertilizer, soap and detergent, rubber, and phosphate industries. The Guidelines do not establish limits for every chemical that may appear in the effluent; rather they set parameters for such factors as pH, total suspended solids (TSS), biochemical oxygen demand (BOD), and chemical oxygen demand (COD). In some cases there are parameters for specific chemicals as well, especially for heavy metals that may be discharged. The number of parameters required to be met depends upon the content of the waste stream and may vary with each effluent source.

Section 307(a) of the Act provides that EPA shall publish a list of toxic pollutants for which special effluent standards are required. The first list, issued on September 7, 1973, designated nine substances as toxic pollutants; none of the high volume chemicals were included. It is possible that some of the high volume chemicals may be regulated under this section in the future although there are no specific plans in this respect at present.

Spills

Almost one-half of the listed high volume chemicals, twenty-three, have been proposed for designation as "hazardous substances" pursuant to Section 311(b) (2) of the Federal Water Pollution Control Act. The statute prohibits the discharge of a harmful quantity of any designated substance into or upon the navigable waters of the United States or adjoining shorelines, or into or upon the waters of the contiguous zone. EPA plans to implement a program to prevent spills, accidental or deliberate, of the designated materials.

The Technical Assistance Data System (TADS) is an information system developed primarily to provide assistance to Region and Headquarters personnel who are responsible for removal or mitigation of the effects of hazardous substances spills. This information is stored on computers and microfiche. Technical information on all but fifteen of the high volume chemicals being considered is included in the TADS file. The data collected for each chemical incorporate a wide variety

of information on the physical, chemical, biological, and toxicological properties of each substance. In collecting the data considerable emphasis was placed on the adverse effects of each substance on water quality. Chronic effects data on all but seventeen of the high volume chemicals are stored in TADS. These data include chronic toxicity limits in parts per million for aquatic life, animals, waterfowl, and plants.

Drinking Water

The recently enacted Safe Drinking Water Act authorizes EPA to promulgate primary and secondary standards for public water systems. Primary standards will establish limits for contaminants to safeguard the public health; secondary standards will apply to the odor, taste, and appearance of the water.

The National Interim Primary Drinking Water Regulations, which are scheduled to be proposed in March 1975, probably will not include maximum contaminant levels for any of the individual high volume chemicals being considered. However, consideration may be given to including some of the high volume chemicals or by-products resulting from their manufacture, particularly in the organic chemical industry, in the revised Regulations to be promulgated in 1977.

Ocean Disposal

The Marine Protection, Research, and Sanctuaries Act of 1972, as amended, prohibits the dumping of certain materials into ocean waters and strictly regulates, through a permit system, the ocean disposal of other materials. The Act provides the authority for fulfilling U.S. commitments made at the International Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter.

These regulations prohibit the dumping of high-level radioactive wastes; materials produced for radiological, chemical, or biological warfare; and, except as trace contaminants, organohalogen compounds, mercury and its compounds, cadmium and its compounds, and various oils and greases. For example, the disposal of ethylene dichloride and vinyl chloride, both organohalogen high volume chemicals, would be prohibited under these regulations.

The permit system authorized by the Act strictly regulates the dumping of wastes containing other high volume chemicals. Each disposal permit is granted on a case-by-case basis specifying conditions under which disposal may take place.

Toxic Substances

The Office of Toxic Substances currently is studying four of the

high volume chemicals, in addition to its work on vinyl chloride. These four are benzene, cumene, terephthalic acid, and titanium dioxide. These efforts are directed towards clarifying whether there are health or environmental risks associated with the chemicals, and analyzing the manufacture, distribution, use, and disposal patterns of the chemicals.

Pesticide Programs

Although approximately one-half of the high volume chemicals under consideration have some use in pesticide products, this use represents only a very small quantity of the total production of these chemicals.* Twenty-two of the high volume chemicals are used as ingredients in pesticide products which are registered by EPA. Prior to registration data must be presented to substantiate a product's efficacy, chemical and toxicological properties, and impact on the environment. Relatively large quantities of three of the chemicals -- ethylene dichloride, ethylene oxide, and chlorine -- are used as sole components of pesticide products. Nineteen other high volume chemicals are used either in limited amounts as the sole component of a pesticide product or in mixtures with other chemicals. In addition a number of high volume chemicals are used as inert ingredients in pesticide formulations.

Office of Air and Waste Management

Air Pollution

National ambient air quality standards have been set for particulate matter, sulfur dioxide, nitrogen dioxide, photochemical oxidants, hydrocarbons, and carbon monoxide. While some of the high volume chemicals may occur as particulates, the particulate standard sets a limit only on the total amount of particulate matter regardless of its components.

Over one-half of the high volume chemicals listed are hydrocarbons and other organic compounds. However, the national ambient air quality standard (NAAQS) for hydrocarbons does not specifically regulate these chemicals. The hydrocarbon standard, which applies to all nonmethane hydrocarbons, was written as a guide to achieving the NAAQS

*In 1972, estimated U.S. production of pesticides was 1.276 billion pounds; total 1972 production of the top fifty chemicals was approximately 397 billion pounds. Sources: Production, Distribution, Use and Environmental Impact Potential of Selected Pesticides, 1974, EPA 540/1-74-901 (p. 19), and Chemical and Engineering News, May 6, 1974 (vol. 52, no. 18, p. 11).

for photochemical oxidants.* In preparing pollutant control strategies for areas that violate the oxidant standard, the states have concentrated primarily on controlling the more reactive organic compounds. However, new evidence showing the importance of the less reactive hydrocarbons suggests a refinement in the earlier approach that will result in control of all major sources of nonmethane hydrocarbons. The precise manner in which organics are controlled varies from state to state. Thus, any of the organic compounds on the high volume chemical list might fall under a state air pollution control regulation somewhere, if atmospheric emissions of that chemical were considered to contribute significantly to photochemical oxidant formation. But, at this time, none of the organic compounds on the list are controlled specifically.

Section 111 of the Clean Air Act requires that EPA set emission standards for new or modified sources which may contribute significantly to air pollution and endanger public health or welfare. Under this provision, EPA has promulgated standards for emissions of acid mist and sulfur oxides from sulfuric acid plants. New source performance standards have also been established for petroleum storage vessels at oil fields, refineries, and other distribution points. To assess potential air pollution impacts, EPA has surveyed the petrochemical industry to identify and characterize significant sources of hydrocarbons. As a result of this survey, more in-depth studies are underway on some of the significant sources of hydrocarbons. Included in these studies are the manufacturing processes for carbon black, ethylene dichloride, acrylonitrile, formaldehyde, and ethylene oxide. At this time, EPA plans to set standards to control hydrocarbons from carbon black plants. Another major area being studied for possible standard setting is the field of organic solvent usage (surface coating, dry cleaning, graphic arts, degreasing).

EPA is currently developing regulations under Section 112 of the Clean Air Act to limit vinyl chloride emissions from vinyl chloride monomer plants and polyvinyl chloride plants. Control of vinyl chloride from ethylene dichloride plants may also be included as a part of the vinyl chloride program.

Solid Waste Management

The Office of Solid Waste Management Programs is currently studying industrial hazardous waste practices and will examine industries in thirteen categories. Three of these categories -- inorganic chemical, organic chemical, and petroleum refining -- include twenty-two of the high volume chemical industries. Analyses of the wastes generated

*Photochemical oxidants are formed in the atmosphere from reactions involving hydrocarbons (and other organics) and nitrogen oxides in the presence of sunlight.

by each of the industries will be made, especially of those wastes which are believed to pose a potential health or environmental hazard upon final disposal. The available treatment and disposal technologies for the identified wastes will be assessed and cost estimates made for incorporating those technologies in existing systems.

In addition, the Office has been conducting analyses of high volume plastics within the framework of the hazardous wastes practices assessments described above. Other activities directed towards plastics are contained in Appendix A.

An EPA workgroup has drafted a policy paper relating to industrially generated sludges/residuals with particular attention to process wastes, hazardous wastes, pollution control residuals, and quantities of thirty-five toxic chemicals in waste streams. Thirty-three industries involving manufacture of almost all of the high volume chemicals have been examined.

Office of Research and Development

The following sections present a number of the relevant EPA research activities in four different program areas: ecological effects, health effects, environmental engineering, and monitoring.

Ecological Effects

Eight of the high volume chemicals are under study at EPA's laboratory at Duluth, Minnesota, in a program designed to develop information on the range of chemical and physical conditions in which aquatic life can survive. The studies test the acute and chronic toxicity of several substances including ammonia, chlorine, formaldehyde, ethylene glycol, acetone, and acrylonitrile. Other research encompasses the sublethal, physiological, and reproductive effects of the substances. The dissolved oxygen requirements of aquatic organisms and the supersaturation effects of nitrogen are also being investigated.

The cycling of some of the substances through the aquatic system, including degradation, transport, transformation, and accumulation patterns, is being studied at Athens, Georgia. Two other chemicals, carbon dioxide and sodium tripolyphosphate, have been examined for their eutrophication effects in Athens and in Corvallis, Oregon.

The Duluth laboratory is examining sewage effluents treated by chlorine to determine whether they are toxic to aquatic life. The results to date indicate that at least in some cases chlorinated sewage effluent is fairly toxic for some distance below the outfall.

Health Effects

Sulfuric acid (as sulfuric acid mist) is one of several chemicals being investigated as an emission from catalytic converters. The purpose of the research is to develop comprehensive, authoritative toxicological data on these substances. Other studies involve the human health effects of exposure to nitrogen oxides; photochemical oxides; and hydrocarbons which, when released into the atmosphere in the presence of oxides of nitrogen and sunlight, lead to the formation of photochemical oxidants such as ozone and nitrogen dioxide.

Findings released by EPA on November 8, 1974, showed the presence in the New Orleans drinking water supply of minute quantities of sixty-six organic chemicals, some of which may be hazardous to human health. Some of these chemicals are on the high volume list. In response to these findings EPA is investigating the role of chlorine, as it is used in treating sewage and drinking water, in the formation of organic compounds. Another study has been initiated that will analyze water supplies from representative cities to determine how widespread the problem may be. Techniques for preventing the chemicals from reaching the water or for removing them from the community system are also being investigated.

Marine Protection

The production wastes of seventeen of the high volume chemical industries have been studied; two other high volume industries are subjects of proposed studies. These studies involve development of techniques for the treatment or disposal of wastes, with primary emphasis on water effluents.

A project, financed jointly by EPA and the State of Louisiana, will develop techniques to treat biorefractories. Biorefractories are found in waste waters of chemical and petrochemical industries and cannot be fully removed by biological means. Some of the refractory industrial wastes found in drinking water whose source is the Mississippi River include such high volume chemicals as acetone, benzene, ethylbenzene, ethylene dichloride, styrene, and toluene. These chemicals had been discharged by plants located along the Mississippi River. Five treatment techniques are now being tested to remove these biorefractories: ozonation, carbon adsorption, solvent extraction, anaerobic/aerobic treatment, and air stripping.

Another project, financed jointly by EPA and the Louisiana Chemical Association, is concerned with developing techniques to eliminate or, if this is not possible, to decrease significantly waste water effluent from ammonia production plants.

rination has been developed as a means to convert hazardous toxic chlorocarbon wastes into useful and marketable commodities. The process, sometimes referred to as chlorolysis, has been demonstrated by Hoechst AG, Frankfurt Germany, in a project supported by EPA. This method is appropriate for treatment of the residues produced during the manufacture of the high volume chemicals ethylene dichloride and vinyl chloride, both chlorinated hydrocarbons.

Monitoring

A research capability exists for the qualitive detection of all of the fifty high volume chemicals in water and air at relatively low concentrations. Reference methods have been published for some of these substances. Those methods applicable to water have been published in 40 CFR 136. The methods, for the most part, have been standardized for use in surface waters and are now being evaluated for use in industrial and other effluents. Methods for ammonia, chlorine, phenols, and some chlorinated organic compounds are included.

With regard to reference methods for substances in air, 40 CFR 53 includes reference and equivalent methods for carbon dioxide and for photochemical oxidants as measured by ozone, and equivalent methods for sulfur dioxide. A reference method for particulates is published in 40 CFR 50. 40 CFR 60 pertains to standards of performance for stationary sources, and includes methods for carbon dioxide, particulate emissions, and sulfuric acid mist. 40 CFR 85 refers to mobile sources of air pollution and sets emission standards for hydrocarbons, carbon monoxides, and nitrogen oxides with testing methods for each. The foregoing methods were published for specific applications and are not necessarily valid for other situations. Improvements in senstitivity and ease of use are being pursued.

Methods exist for most cations and anions of inorganic compounds in both water and air. For water the detection methods for undissociated inorganics and cations or anions, where valence state is of concern, are in very rudimentary stages of development. The situation is similar for substances in air samples although compounds may be identified by the very sophisticated method of electronspectroscopy for chemical analysis.

For organic compounds in air, gas chromatographic methods are applicable. For confirmation of identity, mass spectroscopy and infrared spectroscopy are utilized. In water, the same techniques are used for volatile organic compounds and for organic compounds which may be made volatile by specific chemical reactions. In general nonvolatile organics are not readily determinable.

Ongoing research is designed to increase the EPA capability to

isolate, characterize, and quantify chemicals in environmental media and tissues. Problems relating to sample collection and preservation, critical to obtaining quantitative data, are being researched. Multichemical (mass spectrometry), multielement (spark source and plasma emission spectrometry), and multispeciation techniques are being expanded as essential elements of any reasonable approach to the detection of a broad spectrum of substances in all substrates.

Office of Enforcement and General Counsel

The National Pollution Discharge Elimination System (NPDES), established pursuant to the Federal Water Pollution Control Act, requires industrial, municipal, and other point source dischargers to obtain permits which limit the discharge of pollutants into navigable waters. The permits are based on the Effluent Limitations Guidelines and are issued to thousands of manufacturing companies, including those producing and using the chemicals on the high volume list. Eventually the permits program will be administered by the States but the basic requirements, such as final implementation dates and effluent limits, are developed by EPA and applied nationwide.

ACTIVITIES OF OTHER FEDERAL AGENCIES

Food and Drug Administration

The Food and Drug Administration (FDA) considers the safety, efficacy, and toxicity of ingredients included as components of drugs (human and veterinary), food and food additives, cosmetics, and packaging for such products. While a complete index of FDA activities related to the fifty high volume chemicals is not currently available, Appendix B identifies fourteen chemicals which were involved in food additive petitions pending before the FDA as of June 30, 1974.

In addition, FDA recently has proposed or is in the process of preparing three significant regulations concerning high volume chemicals. Effective May 26, 1974, the amount of chlorine and other chemical components in bottled water is being regulated (38 FR 226). A notice of proposed rule making that would regulate acrylonitrile as used in the manufacture of soft drink bottles was issued on November 4, 1974 (39 FR 213). A general restrictive regulation for vinyl chloride is pending.

Department of Transportation

The Department of Transportation is responsible for regulating the transportation of hazardous materials. This includes requirements for the preparation for transportation -- construction of containers, packaging, weight or volume marking, and other related factors. The Department currently regulates the following as "hazard" classes: flammable and nonflammable, compressed gases, flammable liquids, flammable solids, oxidizer materials, organic peroxides, poison materials, etiologic agents, radioactive materials, corrosives, and explosives. Thirty-eight of the fifty high volume chemicals are currently regulated as hazardous materials.

Due to the hundreds of thousands of commodities shipped, it is generally not feasible to conduct extensive studies or evaluations on an individual commodity basis. Research and development studies conducted by the Department are directed towards a specific hazard class, a certain size container, or a package or container to meet certain performance requirements. Major projects on specific chemicals are conducted only on an emergency basis, such as an unanticipated incident occurring during transport.

The Transportation Safety Act of 1974 (P. L. 93-633) more clearly defines the scope, responsibilities, and enforcement authority of the Department and is expected to result in significant changes in the regulation and control of hazardous materials.

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Consumer Product Safety Commission

Pursuant to the Federal Hazardous Substances Act and the Poison Prevention Packaging Act, the Consumer Product Safety Commission (CPSC) has responsibility for regulating a wide range of chemical products intended for household use. Several of the high volume chemicals are subject to CPSC regulations. Household substances containing ten percent or more by weight of sulfuric acid (except in wet-cell storage batteries) are subject to special packaging requirements. Sixteen of the high volume chemicals are subject to labeling requirements for certain concentrations and conditions: nitric acid, hydrochloric acid, phenol, acetic acid, sodium hydroxide, ammonia, methanol, ethylene glycol, sodium carbonate, sodium silicate, sodium tripolyphosphate, benzene, toluene, xylene, formaldehyde, and acetone. Also, on May 23, 1974, CPSC banned the use of vinyl chloride as a propellant or component of any consumer product.

In addition to its regulatory activities, CPSC is supporting research studies to determine the effects of exposure to halogenated hydrocarbon propellants. A series of monographs on the toxicity and synergistic effects of chemicals is being proposed to help assess the safety of future products. Thirty-four product categories have been targets for possible monographs including flame retardant chemicals, water softeners, cleaning agents, and paints and varnishes.

National Institute for Occupational Safety and Health

Forty-three of the high volume chemicals are included on the Toxic Substances List published in 1974 by the National Institute for Occupational Safety and Health (NIOSH). The purpose of the List is to identify "all known toxic substances" and to provide relevant data on the toxic effects of various levels of exposure to those substances. Substances are designated as toxic if exposure to or misuse of the substances produces toxic effects. These effects include acute, carcinogenic, neoplastic, mutagenic, teratogenic, and other adverse effects.

NIOSH has published criteria documents for sulfuric acid, toluene, ammonia, benzene, and vinyl chloride, and is planning to publish documents for phenol, chlorine, phosphoric acid, ethylene dichloride, xylene, nitric acid, formaldehyde, and sodium hydroxide. A recent contract with Stanford Research Institute for eighteen new criteria documents will include documents for methanol, isopropanol, and carbon dioxide. These criteria documents take into account plant inspections and critical evaluations of all published literature relevant to the task of determining the extent of hazard produced by various exposure levels of a substance. The criteria documents recommend standards of exposure which would minimize toxic effects in an occupational environment.

Validation studies for analytical methods used for sulfuric acid,

chlorine, benzene, ethylene dichloride, vinyl chloride, hydrochloric acid, carbon dioxide, and isopropanol are being conducted at the NIOSH laboratory in Cincinnati. The laboratory is working on sampling and chemical analysis methods which use portable detection and analysis devices for on-site readings in the plants.

Occupational Safety and Health Administration

The Occupational Safety and Health Administration promulgates regulations setting standards for the workplace, drawing on the criteria documents prepared by NIOSH. At present, there are standards for twenty-seven of the high volume chemicals. Some of these in addition to vinyl chloride will undoubtedly be considered for revision in the near future.

National Cancer Institute

As set forth in the National Cancer Institute (NCI) publication, Survey of Compounds Which Have Been Tested for Carcinogenic Activity, almost one-half of the high volume chemicals were tested for carcinogenicity as of 1971. The tests must have been published in the scientific literature to have been included in the survey. All tests involve animals which were examined for tumors thirty days or more after initial exposure. Research published in 1972 and 1973 will be included in Volume 7 of the survey, which should be available soon and perhaps include more of the high volume chemicals. While this publication is a useful reference, the research reports are not always critically evaluated before being included and should not be viewed as necessarily authoritative.

NCI also supports publications of the International Agency for Research on Cancer (IARC) which publishes a series entitled IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man. The monographs summarize the evidence for carcinogenicity of selected chemicals. A working group of experts invited by the IARC compiles and evaluates experimental data on the substances. Their evaluation is then published in a monograph. None of the early monographs considers any of the high volume chemicals; however, future volumes will address some of them.

Another publication series partially sponsored by NCI and IARC, Information Bulletins on the Survey of Chemicals Being Tested for Carcinogenicity, indicates that four high volume chemicals are currently being tested for carcinogenicity: urea, styrene, carbon black, and titanium dioxide. In addition, tests are planned for two others: sulfuric acid and formaldehyde. This information is current through May 1974.

The Stanford Research Institute is working on a contract to deter-

mine the levels of exposure of man to various substances. These exposure levels are one of the criteria used by NCI in selecting chemicals for bioassay studies. At the present time, NCI has about twenty contracts to assess carcinogenicity through tests on rats, mice, and hamsters. Four hundred and fifty substances are involved in these bioassay studies. Three of these are on the list of high volume chemicals; many others are derivatives of high volume chemicals.

National Institute for Environmental Health Sciences

The National Institute for Environmental Health Sciences (NIEHS) is conducting or supporting work on a variety of the fifty high volume chemicals. In its grants program, NIEHS is examining the biological effect of seven of the chemicals: benzene, ethylene dichloride, formaldehyde, vinyl chloride, phenol, ethanol, and titanium dioxide.

Several high volume chemicals have been tested in the past for mutagenicity (ethylene oxide, benzene, toluene, vinyl chloride, and propylene oxide). Also, NIEHS partially supports the Environmental Mutagen Information Center at Oak Ridge which maintains a current bibliography of all agents that have been tested for mutagenic potential. Additionally, the Environmental Mutagenesis Branch is developing a contract for mutagenic testing in bacterial systems, and it is probable that some of the high volume chemicals will be evaluated in this program.

The Pharmacology Branch's research activities with the high volume chemicals include animal studies on the following: sulfuric acid (inhalation effects of sulfuric acid mist), oxygen (effects on metabolism, biosynthesis), sodium hydroxide (inhalation effects), styrene (metabolism study), aluminum sulfate (toxic effects from aerosols). Benzene, p-xylene, and phenol are being studied as part of an aerotoxicology research program on solvent toxicity.

The Environmental Toxicology Branch is supporting a study to determine the toxicity of vinyl chloride on different species and to clarify which common laboratory species is best able to predict human toxicity.

National Bureau of Standards

The National Bureau of Standards (NBS) conducts research to improve the accuracy of measurements. Current work is underway to develop a method to measure formaldehyde in air and to calibrate such measurements. Other work is concerned with measuring hydrocarbons, such as benzene, xylene, and butadiene, and derivatives in water at low levels. A low level chlorine monitoring instrument developed at NBS is being tested and demonstrated at the Virginia Institute of Marine Sciences.

Center for Disease Control

In the toxic substances area, the Center for Disease Control (CDC) has been primarily concerned with heavy metals, such as lead and mercury; the chlorinated hydrocarbon, mirex; phenols, such as trichlorophenol; and other substances not on the high volume list. In the future, CDC plans to work on some of the listed organic compounds. In addition, CDC has been involved in various epidemiological studies including a major effort directed toward vinyl chloride and two involving methyl compounds done in conjunction with NIOSH.

Department of Defense

The activities of the Department of Defense (DOD) and the military branches involve various uses of the high volume chemicals. For example, sodium hydroxide is used in "demilitarization" of toxic chemicals such as nerve gas. Liquid oxygen is used as a rocket propellant. However, research sponsored by DOD is required by Congress to be related to a military mission. Thus, few, if any, research activities are specifically directed towards the listed chemicals.

An inventory of the environmental and related research efforts of DOD is published annually by the Office of the Director, Defense Research and Engineering, Office of the Secretary of Defense. The latest report, "Area Coordinating Paper No. 42, Environmental Quality", was published in June 1974. Some current projects involve high volume chemicals. One is designed to develop instrumentation to quantify the low concentrations of hydrochloric acid found in missile exhaust plumes. Another deals with the problems of handling and transporting liquid oxygen.

The Department of the Army, Medical Research and Development Command, currently is supporting research efforts in toxicology, involving mammalian and aquatic animals. The projects are concerned with determining the effects of chemicals that find their way into waste waters from the manufacture of Army ammunition. Most of the chemicals are not on the high volume list but are munition compounds such as trinitrotoluene and nitroglycerin.

Other activities sponsored by the Army that may involve high volume chemicals include research to develop environmentally preferred alternatives for solvents, paints, and other organic chemical products, research on sewage treatment systems, development of emission controls for mobile equipment and aircraft, treatment of wastewaters, and disposal of pesticides.

The Army's Research and Development Office has developed a computer system for retrieving chemical information, the Chemical In-

formation and Data System (CIDS), located at Edgewood Arsenal, Maryland. CIDS is not a document retrieval system per se. Rather, it provides "pointers" to documents by describing their contents in terms of information descriptors and document identification. The information is searched in terms used by chemists, such as chemical formulae and substructural definitions. Thus, searches can be made not only for specific compounds, but also for compounds within specified "families" which contain particular substructures and/or activity groups. There are now 42,000 chemicals programmed in the system; information on all but two of the high volume chemicals may be retrieved directly with CIDS.

APPENDIX A

	1 Industries Covered by Effluent Guidelines Produce or Use Chemical	2 Proposed for Designation as "Hazardous Substance" under FWPCA, 311(b): 39FR164
Sulfuric Acid	X	X
Oxygen	X	
Ammonia	X	X
Ethylene	X	
Sodium Hydroxide	X	X
Chlorine	X	X
Nitrogen	X	
Sodium Carbonate	X	
Nitric Acid	X	X
Ammonium Nitrate	X	X
Phosphoric Acid	X	X
Benzene	X	X
Propylene	X	
Ethylene Dichloride	X	
Urea	X	
Methanol	X	
Toluene	X	X
Ethylbenzene	X	X
Formaldehyde	X	X
Styrene	X	X
Xylene	X	X
Vinyl Chloride	X	
Hydrochloric Acid	X	X
Ammonium Sulfate	X	X
Ethylene Oxide	X	
Butadiene	X	
Carbon Black	X	
Ethylene Glycol	X	
Sodium Sulfate	X	
Carbon Dioxide	X	
Dimethyl Terephthalate	X	
Cumene	X	
Terephthalic Acid	X	
Acetic Acid	X	X
Calcium Chloride	X	
Cyclohexane	X	X
p-Xylene	X	X
Aluminum Sulfate	X	X
Phenol	X	X
Acetone	X	
Ethanol	X	
Sodium Tripolyphosphate	X	
Isopropanol	X	X
Propylene Oxide	X	
Acetic Anhydride	X	X
Titanium Dioxide	X	
Vinyl Acetate	X	X
Sodium Silicate	X	X
Acetaldehyde	X	X
Acrylonitrile	X	X

EPA ACTIVITIES DIRECTED TO HIGH VOLUME CHEMICALS

	3 General Information in Technical Assistance Data System (TADS)	4 Data on Chronic Toxicity on Aquatic Life in TADS
Sulfuric Acid	X	X
Oxygen		X
Ammonia	X	X
Ethylene	X	
Sodium Hydroxide	X	
Chlorine	X	
Nitrogen		X
Sodium Carbonate		X
Nitric Acid	X	X
Ammonium Nitrate	X	X
Phosphoric Acid	X	X
Benzene	X	X
Propylene	X	
Ethylene Dichloride	X	
Urea	X	X
Methanol	X	X
Toluene	X	X
Ethylbenzene	X	X
Formaldehyde	X	X
Styrene	X	X
Xylene		X
Vinyl Chloride	X	
Hydrochloric Acid	X	
Ammonium Sulfate	X	
Ethylene Oxide	X	X
Butadiene		
Carbon Black		X
Ethylene Glycol	X	X
Sodium Sulfate	X	X
Carbon Dioxide		X
Dimethyl Terephthalate		
Cumene		
Terephthalic Acid		
Acetic Acid	X	X
Calcium Chloride	X	X
Cyclohexane	X	X
p-Xylene	X	X
Aluminum Sulfate	X	X
Phenol	X	X
Acetone	X	X
Ethanol		
Sodium Tripolyphosphate		
Isopropanol		
Propylene Oxide		
Acetic Anhydride	X	X
Titanium Dioxide		X
Vinyl Acetate	X	
Sodium Silicate	X	X
Acetaldehyde	X	X
Acrylonitrile	X	X

Appendix A

EPA ACTIVITIES DIRECTED TO HIGH VOLUME CHEMICALS

	5 Ocean Disposal		6
	(a) prohibited	(b) strictly regulated	Under Study by Office of Toxic Substances
Sulfuric Acid		X	
Oxygen		X	
Ammonia		X	
Ethylene		X	
Sodium Hydroxide		X	
Chlorine		X	
Nitrogen		X	
Sodium Carbonate		X	
Nitric Acid		X	
Ammonium Nitrate		X	
Phosphoric Acid		X	
Benzene		X	X
Propylene		X	
Ethylene Dichloride	X		
Urea		X	
Methanol		X	
Toluene		X	
Ethylbenzene		X	
Formaldehyde		X	
Styrene		X	
Xylene		X	
Vinyl Chloride	X		
Hydrochloric Acid		X	
Ammonium Sulfate		X	
Ethylene Oxide		X	
Butadiene		X	
Carbon Black		X	
Ethylene Glycol		X	
Sodium Sulfate		X	
Carbon Dioxide		X	
Dimethyl Terephthalate		X	
Cumene		X	X
Terephthalic Acid		X	X
Acetic Acid		X	
Calcium Chloride		X	
Cyclohexane		X	
p-Xylene		X	
Aluminum Sulfate		X	
Phenol		X	
Acetone		X	
Ethanol		X	
Sodium Tripolyphosphate		X	
Isopropanol		X	
Propylene Oxide		X	
Acetic Anhydride		X	
Titanium Dioxide		X	X
Vinyl Acetate		X	
Sodium Silicate		X	
Acetaldehyde		X	
Acrylonitrile		X	

Appendix A

EPA ACTIVITIES DIRECTED TO HIGH VOLUME CHEMICALS

	7 Used in Registered Pesticides	8 May Be Regulated under Air Standard for Nonmethane Hydrocarbons
Sulfuric Acid	X	
Oxygen		
Ammonia		
Ethylene	X	X
Sodium Hydroxide	X	
Chlorine	X	
Nitrogen		
Sodium Carbonate	X	
Nitric Acid		
Ammonium Nitrate		
Phosphoric Acid	X	
Benzene	X	X
Propylene		X
Ethylene Dichloride	X	X
Urea		
Methanol	X	X
Toluene		X
Ethylbenzene		X
Formaldehyde	X	X
Styrene		X
Xylene	X	X
Vinyl Chloride		X
Hydrochloric Acid	X	
Ammonium Sulfate	X	
Ethylene Oxide	X	X
Butadiene		X
Carbon Black		
Ethylene Glycol	X	
Sodium Sulfate		
Carbon Dioxide		
Dimethyl Terephthalate		
Cumene		X
Terephthalic Acid		
Acetic Acid		
Calcium Chloride		
Cyclohexane		X
p-Xylene		X
Aluminum Sulfate		
Phenol	X	
Acetone		X
Ethanol	X	X
Sodium Tripolyphosphate	X	
Isopropanol	X	
Propylene Oxide	X	X
Acetic Anhydride		X
Titanium Dioxide		
Vinyl Acetate		X
Sodium Silicate		
Acetaldehyde		X
Acrylonitrile	X	X

Appendix A

EPA ACTIVITIES DIRECTED TO HIGH VOLUME CHEMICALS

	9 Included in Survey Reports on Air Emissions from Petrochemical Industry	10 Included in Hazardous Waste Disposal Studies
Sulfuric Acid		
Oxygen		X
Ammonia		
Ethylene	X	X
Sodium Hydroxide		
Chlorine		X
Nitrogen		X
Sodium Carbonate		
Nitric Acid		
Ammonium Nitrate		
Phosphoric Acid		
Benzene		X
Propylene		X
Ethylene Dichloride	X	
Urea		X
Methanol		X
Toluene		
Ethylbenzene		
Formaldehyde	X	
Styrene	X	X
Xylene		X
Vinyl Chloride	X	
Hydrochloric Acid		X
Ammonium Sulfate		
Ethylene Oxide	X	X
Butadiene		X
Carbon Black	X	
Ethylene Glycol		X
Sodium Sulfate		X
Carbon Dioxide		
Dimethyl Terephthalate		
Cumene		
Terephthalic Acid	X	
Acetic Acid	X	
Calcium Chloride		X
Cyclohexane		
p-Xylene		
Aluminum Sulfate		
Phenol	X	X
Acetone		X
Ethanol		X
Sodium Tripolyphosphate		
Isopropanol		
Propylene Oxide		
Acetic Anhydride		
Titanium Dioxide		
Vinyl Acetate	X	
Sodium Silicate		X
Acetaldehyde	X	X
Acrylonitrile		X

Appendix A

EPA ACTIVITIES DIRECTED TO HIGH VOLUME CHEMICALS

	11 Research on Toxic Effects on Aquatic Life	12 Research on Waste Treatment and Disposal
Sulfuric Acid		X
Oxygen	X	
Ammonia	X	X
Ethylene		
Sodium Hydroxide		
Chlorine	X	
Nitrogen	X	
Sodium Carbonate		
Nitric Acid		X
Ammonium Nitrate		X
Phosphoric Acid		X
Benzene		
Propylene		
Ethylene Dichloride		X
Urea		X
Methanol		
Toluene		
Ethylbenzene		X
Formaldehyde	X	
Styrene		X
Xylene		
Vinyl Chloride		X
Hydrochloric Acid		X
Ammonium Sulfate		X
Ethylene Oxide		X
Butadiene		
Carbon Black		
Ethylene Glycol	X	X
Sodium Sulfate		
Carbon Dioxide		
Dimethyl Terephthalate		
Cumene		
Terephthalic Acid		
Acetic Acid		(proposed)
Calcium Chloride		
Cyclohexane		
p-Xylene		
Aluminum Sulfate		
Phenol		X
Acetone	X	
Ethanol		
Sodium Tripolyphosphate		
Isopropanol		
Propylene Oxide		X
Acetic Anhydride		
Titanium Dioxide		X
Vinyl Acetate		
Sodium Silicate		
Acetaldehyde		
Acrylonitrile	X	(proposed)

EPA ACTIVITIES DIRECTED TO HIGH VOLUME CHEMICALS

	13 Chemical or Ionic Components Can be Identified in Water	14 Chemical or Ionic Components Can be Identified in Air by Gas Chromatography (GC) or Other Methods (X)
Sulfuric Acid	X	X
Oxygen	X	X
Ammonia	X	X
Ethylene	X	GC
Sodium Hydroxide	X	X
Chlorine	X	X
Nitrogen	X	GC
Sodium Carbonate	X	X
Nitric Acid	X	X
Ammonium Nitrate	X	X
Phosphoric Acid	X	X
Benzene	X	GC
Propylene	X	GC
Ethylene Dichloride	X	GC
Urea	X	X
Methanol	X	GC
Toluene	X	GC
Ethylbenzene	X	GC
Formaldehyde	X	GC
Styrene	X	GC
Xylene	X	GC
Vinyl Chloride	X	GC
Hydrochloric Acid	X	X
Ammonium Sulfate	X	X
Ethylene Oxide	X	GC
Butadiene	X	GC
Carbon Black	X	X
Ethylene Glycol	X	GC
Sodium Sulfate	X	X
Carbon Dioxide	X	GC
Dimethyl Terephthalate	X	GC
Cumene	X	GC
Terephthalic Acid	X	GC
Acetic Acid	X	GC
Calcium Chloride	X	X
Cyclohexane	X	GC
p-Xylene	X	GC
Aluminum Sulfate	X	X
Phenol	X	GC
Acetone	X	GC
Ethanol	X	GC
Sodium Tripolyphosphate	X	X
Isopropanol	X	GC
Propylene Oxide	X	GC
Acetic Anhydride	X	GC
Titanium Dioxide	X	X
Vinyl Acetate	X	GC
Sodium Silicate	X	X
Acetaldehyde	X	GC
Acrylonitrile	X	GC

APPENDIX B

ACTIVITIES OF OTHER FEDERAL AGENCIES DIRECTED TO HIGH VOLUME CHEMICALS

	15 Pending FDA Approval as of 6/30/74	16 Considered "Hazardous Material" by DOT 40 CFR/170-180
Sulfuric Acid		X
Oxygen		X
Ammonia		X
Ethylene	X	X
Sodium Hydroxide		X
Chlorine	X	X
Nitrogen		X
Sodium Carbonate		
Nitric Acid		X
Ammonium Nitrate		X
Phosphoric Acid		X
Benzene		X
Propylene		X
Ethylene Dichloride	X	X
Urea	X	
Methanol		X
Toluene		X
Ethylbenzene		X
Formaldehyde	X	X
Styrene	X	X
Xylene		X
Vinyl Chloride		X
Hydrochloric Acid	X	X
Ammonium Sulfate		
Ethylene Oxide	X	X
Butadiene		X
Carbon Black	X	
Ethylene Glycol		X
Sodium Sulfate	X	
Carbon Dioxide		X
Dimethyl Terephthalate		
Cumene		X
Terephthalic Acid		
Acetic Acid		X
Calcium Chloride		
Cyclohexane		X
p-Xylene		X
Aluminum Sulfate		
Phenol	X	X
Acetone		X
Ethanol		X
Sodium Tripolyphosphate		
Isopropanol		X
Propylene Oxide		X
Acetic Anhydride		X
Titanium Dioxide		
Vinyl Acetate	X	X
Sodium Silicate		
Acetaldehyde		X
Acrylonitrile	X	X

Appendix B

ACTIVITIES OF OTHER FEDERAL AGENCIES DIRECTED TO HIGH VOLUME CHEMICALS

	[17] Regulated by CPSC	[18] NIOSH Toxic Substances List
Sulfuric Acid	X	X
Oxygen		
Ammonia	X	X
Ethylene		
Sodium Hydroxide	X	X
Chlorine		X
Nitrogen		
Sodium Carbonate	X	X
Nitric Acid	X	X
Ammonium Nitrate		X
Phosphoric Acid		X
Benzene	X	X
Propylene		
Ethylene Dichloride		X
Urea		
Methanol	X	X
Toluene	X	X
Ethylbenzene		X
Formaldehyde	X	X
Styrene		X
Xylene	X	X
Vinyl Chloride	X	X
Hydrochloric Acid	X	X
Ammonium Sulfate		X
Ethylene Oxide		X
Butadiene		X
Carbon Black		
Ethylene Glycol	X	X
Sodium Sulfate		X
Carbon Dioxide		
Dimethyl Terephthalate		X
Cumene		X
Terephthalic Acid		X
Acetic Acid	X	X
Calcium Chloride		X
Cyclohexane		X
p-Xylene		X
Aluminum Sulfate		X
Phenol	X	X
Acetone	X	X
Ethanol		X
Sodium Tripolyphosphate	X	X
Isopropanol		X
Propylene Oxide		X
Acetic Anhydride		X
Titanium Dioxide		X
Vinyl Acetate		X
Sodium Silicate	X	X
Acetaldehyde		X
Acrylonitrile		X

ACTIVITIES OF OTHER FEDERAL AGENCIES DIRECTED TO HIGH VOLUME CHEMICALS

	19 NIOSH Criteria Document: (a) completed; (b) in preparation; (c) position on priority list			20 Included in NCI Publication of Carcinogenicity Tests as of 1971
	(a)	(b)	(c)	
Sulfuric Acid	X		15	X
Oxygen				
Ammonia	X		19	X
Ethylene			325	
Sodium Hydroxide		X	27	X
Chlorine		X	76	
Nitrogen			291	
Sodium Carbonate				
Nitric Acid		X	38	X
Ammonium Nitrate			144	
Phosphoric Acid		X	100	
Benzene	X		1	X
Propylene				
Ethylene Dichloride		X	103	X
Urea				X
Methanol		X	32	
Toluene	X		44	X
Ethylbenzene			378	X
Formaldehyde		X	177	X
Styrene			134	X
Xylene		X	62	X
Vinyl Chloride	X		206	X
Hydrochloric Acid			165	X
Ammonium Sulfate				X
Ethylene Oxide			451	X
Butadiene			466	
Carbon Black			111	X
Ethylene Glycol				
Sodium Sulfate				
Carbon Dioxide		X	16	
Dimethyl Terephthalate				
Cumene			281	
Terephthalic Acid				
Acetic Acid			82	X
Calcium Chloride				X
Cyclohexane			454	X
p-Xylene			62	
Aluminum Sulfate				
Phenol		X	123	X
Acetone			6	X
Ethanol			142	X
Sodium Tripolyphosphate				
Isopropanol		X	28	X
Propylene Oxide			204	
Acetic Anhydride			181	
Titanium Dioxide			205	
Vinyl Acetate			127	
Sodium Silicate				
Acetaldehyde			427	X
Acrylonitrile			94	

Appendix B

ACTIVITIES OF OTHER FEDERAL AGENCIES DIRECTED TO HIGH VOLUME CHEMICALS

	21 Being Tested for Carcinogenicity as of 5/74 (NCI)	22 NIEHS Health Effects Activities
Sulfuric Acid	tests planned	X
Oxygen		X
Ammonia		
Ethylene		
Sodium Hydroxide		X
Chlorine		
Nitrogen		
Sodium Carbonate		
Nitric Acid		
Ammonium Nitrate		
Phosphoric Acid		
Benzene		X
Propylene		
Ethylene Dichloride		X
Urea		
Methanol	X	
Toluene		X
Ethylbenzene		
Formaldehyde	tests planned	X
Styrene	X	X
Xylene		X
Vinyl Chloride		X
Hydrochloric Acid		
Ammonium Sulfate		X
Ethylene Oxide		X
Butadiene		
Carbon Black	X	
Ethylene Glycol		
Sodium Sulfate		
Carbon Dioxide		
Dimethyl Terephthalate		
Cumene		
Terephthalic Acid		
Acetic Acid		
Calcium Chloride		
Cyclohexane		
p-Xylene		X
Aluminum Sulfate		
Phenol		X
Acetone		
Ethanol		X
Sodium Tripolyphosphate		
Isopropanol		
Propylene Oxide		X
Acetic Anhydride		
Titanium Dioxide	X	X
Vinyl Acetate		
Sodium Silicate		
Acetaldehyde		
Acrylonitrile		

HIGH VOLUME CHEMICALS

23

Included in DOD
Chemical Information Data System

Sulfuric Acid	X
Oxygen	X
Ammonia	X
Ethylene	X
Sodium Hydroxide	X
Chlorine	X
Nitrogen	X
Sodium Carbonate	X
Nitric Acid	X
Ammonium Nitrate	X
Phosphoric Acid	X
Benzene	X
Propylene	X
Ethylene Dichloride	X
Urea	X
Methanol	X
Toluene	X
Ethylbenzene	X
Formaldehyde	X
Styrene	X
Xylene	X
Vinyl Chloride	X
Hydrochloric Acid	X
Ammonium Sulfate	X
Ethylene Oxide	X
Butadiene	X
Carbon Black	
Ethylene Glycol	X
Sodium Sulfate	X
Carbon Dioxide	X
Dimethyl Terephthalate	X
Cumene	X
Terephthalic Acid	X
Acetic Acid	X
Calcium Chloride	X
Cyclohexane	X
p-Xylene	X
Aluminum Sulfate	X
Phenol	X
Acetone	X
Ethanol	X
Sodium Tripolyphosphate	X
Isopropanol	X
Propylene Oxide	X
Acetic Anhydride	X
Titanium Dioxide	X
Vinyl Acetate	X
Sodium Silicate	
Acetaldehyde	X
Acrylonitrile	X

APPENDIX C

EFFLUENT LIMITATIONS GUIDELINES

Almost all of the industrial categories for which Effluent Limitations Guidelines have been promulgated involve one or more of the high volume chemicals. The chemical industries listed below either use or produce a significant number and/or quantity of these chemicals.

-- Organic Chemicals Manufacturing Point Source Category
Final regulations published 4/25/74, effective 5/13/74
39 FR 81, Part II
Development document: EPA 440/1474-009-a

Ethylene, propylene, ethylene dichloride, methanol, ethylbenzene, formaldehyde, styrene, vinyl chloride, ethylene oxide, butadiene, ethylene glycol, dimethyl terephthalate, terephthalic acid, acetic acid, cyclohexane, phenol, acetone, vinyl acetate, acetaldehyde.

-- Inorganic Chemicals Manufacturing Point Source Category
Final regulations published 3/12/74, effective 5/13/74
39 FR 49, Part II
Development document: EPA 440/1-74-007-a

Sulfuric acid, sodium hydroxide, chlorine, sodium carbonate, nitric acid, hydrochloric acid, sodium sulfate, calcium chloride, aluminum sulfate, titanium dioxide, sodium silicate.

-- Plastics and Synthetics Point Source Category
Final regulations published 4/5/74, effective 6/4/74
39 FR 67, Part II
Development document: EPA 440/1-74-010-a

Styrene, butadiene, acrylonitrile.

-- Fertilizer Manufacturing Point Source Category
Final regulations published 4/8/74, effective 6/7/74
39 FR 68, Part III
Development document: EPA 440/1-74-001-b

Sulfuric acid, phosphoric acid, nitric acid, urea, ammonium nitrate, ammonia.

-- Soap and Detergent Manufacturing Point Source Category
Final regulations published 4/12/74, effective 6/11/74
39 FR 72, Part II
Development Document: EPA 440/1-74-018-a

Sodium hydroxide, sodium tripolyphosphate, methanol, sulfuric acid, urea, ethanol, phenol.

-- Rubber Processing Point Source Category
Final regulations published 2/21/74, effective 4/22/74
39 FR 36, Part II
Development document: EPA 440/1-74-013-a

Carbon black, styrene, butadiene, acrylonitrile, ethylene, propylene, sodium hydroxide.

-- Phosphate Manufacturing Point Source Category
Final regulations published 2/20/74, effective 4/22/74
39 FR 35, Part II
Development document: EPA 440/1-74-006-a

Phosphoric acid, sodium tripolyphosphate.

APPENDIX D

HIGH VOLUME PLASTICS

While the focus of this Report has been on the high volume chemicals, closely related Federal research and regulatory efforts have been directed toward the high volume plastics, including the following:

	1973 Production (Billions of Pounds)
Thermosetting resins	
Epoxies (unmodified)	0.22
Polyesters (unsaturated)	1.05
Urea resins	0.87
Melamine resins	0.17
Phenolic and other tar acid resins	1.39
Thermoplastic resins	
Polyethylene	
Low-density	5.80
High-density	2.64
Polypropylene and copolymers	2.16
Styrene and copolymers	5.02
Polyvinyl chloride and copolymers	4.56
TOTAL	23.88*

In addition to the hazardous waste assessment project discussed in the main body of this Report, the EPA Office of Solid Waste Management Programs is supporting efforts to predict the potential problem areas related to the production, use, and disposal of plastics through 1980 including all of the high volume plastics. A directly related study of plasticizers is being considered. In addition, some of the major completed studies are:

"Incineration of Plastics Found in Municipal Waters", Syracuse, University, August 28, 1972, EC-00304 (EPA).

"The Beverage Container Problem: Analysis and Recommendations", September 1972, R2-72-059 (EPA).

"Disposal of Polymers Solid Waste by Primary Polymer Producers and Plastics Fabricators", 1972, SW-34c (EPA).

"Corrosion Studies in Municipal Incinerators", 1972, SW-72-3-3 (EPA).

"Environmental Aspects of Plastics Waste Industries", George L. Hoffman, June, 1972 (EPA).

"New Chemical Concepts for Utilization of Waste Plastics", 1971, SW-16c (EPA).

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